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ABSTRACT

A project investigated the use of instant photography for creating synthesis between image and language, between pictures and words and thus stimulating the right-brain learning of students. By 1983 over 1 million students (including the learning disabled and hearing impaired) across the United States and Canada had participated in the project, and evaluation data revealed a high level of satisfaction. The project was rated effective in motivating students to learn, teaching visual/spatial awareness, increasing the relevance of classroom learning, and teaching basic skills. Formal evaluation of its effect on creative writing demonstrated that Ss using instant cameras, film, and a curriculum guide made significantly greater improvements in their writing ability than did control Ss. Additional benefits were noted in self esteem (especially in low achievers and quiet or shy children), enhanced communication, increased responsibility, more collaboration in classrooms, heightened senses of autonomy and authority, improved student-teacher relations, enhanced writing and visualization skills and transfer to other domains of thinking. (CL)

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Stimulating and Teaching Thinking Through the Integration of Left and Right Hemispheric Brain Activity

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(A paper presented at the
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". . .and what is the use of a book," thought Alice, "without pictures or conversations?"

Lewis Carroll, Alice's Adventures in Wonderland

Introduction

For the past six years, a group of researchers in Cambridge, MA., have been studying some widespread educational problems and attempting to develop theory, strategy, and technology to deal effectively with them. The identified problems can be seen as common failures of the public school system. However, the word "failure" is used here not in a blaming sense. It is recognized that, in contemporary American culture, schools and teachers have not been given adequate material, moral, or ideological support to enable them to solve the often desperate problems that assail them. By "failure", then, is meant an inability to bring millions of young people into the kind of growth, accomplishment, and learning that they, as members of a wealthy democracy, have a right to expect would be part of their growing-up process.

What are these failures, as identified by this research group? They include the inability of schools and teachers to achieve the following educational goals, which can be considered "basic" in the light of contemporary knowledge of the nature and context of learning:

* The development among students of a high level of self esteem, so that they regard themselves as capable of learning whatever it takes to survive and prosper in their own culture.

* Conduct the teaching/learning process in such a way that students who are visually acute and sensitive and verbally less adroit ... "right hemispheric dominant" students ... feel at home in school and are enabled to learn rapidly, effectively and confidently.

* Use our constantly growing knowledge of right and left hemispheric brain research to plan and conduct learning activities that will integrate the functions of the two hemispheres in ways that maximize students' learning.

* Make the teaching/learning process one that combines abstract and concrete learning experiences in ways that catch, hold, and engage many human senses.

* Capitalize on the fact that most students are more at home in the visual world than are their teachers. Use this fact to overcome the predominant boredom and feelings of incompetence that many students feel in school.

* Use our new knowledge of the visual, right-hemispheric domain to attack successfully the widespread inability of young people to write clearly, effectively and elegantly.

* Help students to develop a sense of "ownership" in their school, their own work, and their educational development.

* Help students to develop a sense of responsibility for themselves, for common property, and toward the groups in which they hold membership.

* Develop links between public school and community that will provide the kind of strong parental support that creates a context for student motivation and achievement.

* Enhance teacher-student communication and understanding so that mutual respect grows and a climate develops that dignifies the process and stimulates learning.

* Create a climate of trust, collaboration, and mutual helpfulness in classrooms and schools, in contrast to the prevalent atmosphere of fear, competition, and alientated individualism.

* Generate a teaching/learning situation in which students receive rapid, accurate, and non-punitive feedback on their ideas, work and accomplishments.

* Make it easier for learning in one field to be transferred by students to other fields and areas of skill.

Mindful of these, and other, lacks in the educational experiences of most ... or at least many ... public school students, the Cambridge-based research group began to explore the use of instant photography as a tool that might be used to

launch a new assault on some of these problems. The group saw instant photography as a means for creating a productive synthesis between image and language, between pictures and words.

In 1978, this endeavor became formalized with support from schools, universities, and corporation. With technological and material support from the Polaroid Corporation, the group of university faculty, school teachers, and photographic experts began to explore the dimensions of this educational challenge. Over the next three years, they developed an appropriate technology, curriculum guide, and pedagogical guidelines to test the hypothesis that instant photography might be a link that would unlock the creative potentialities of combining right and left hemispheric functions of the brain, and move us effectively towards the solution of some of the above problems.

The visual/verbal connection

Before describing some of the events and effects of this research, it is necessary to provide a little theoretical background by making a brief excursion into left and right hemispheric brain research.

Many people are by now familiar with the research on hemispheric differentiation carried out in the 1960's, 1970's, and 1980's by, among others, Ornstein, Bogen, Kinsbourne, and Wittrock.[1] Such familiarity should permit me to summarize briefly some of the principal findings.

These researchers documented the phenomenon that, in most people, the left and right cortical hemispheres of the brain have specialized functions and process data in different ways.

The left hemisphere stores and uses data predominantly through words and logical concepts. It appears to be superior to the right hemisphere in complex language expression, verbal patterning, sequencing, assigning attributes, and in analytic logical, and inductive reasoning. However, it seems to categorize in familiar ways

... to use the main highways of the mind, to put new stuff into old boxes, and to lack synthetic strength. It is a great survival resource, for it helps us to cope successfully with the already categorized patterns and pitfalls of our culture.

The right hemisphere stores and uses data predominantly through visual images, symbols, senses, and intuition. It appears to be superior to the left hemisphere in visual-spatial expression, non-verbal, holistic synthesis, in meaningful, spatial patterning and deductive reasoning. However, it seems to lack analytic strength and the images it creates tend to disappear rapidly if not verbalized through left hemispheric processing. It is a great creative resource, for it helps us to invent the new ideas, meanings, and contexts that are necessary for dealing effectively with the unpredictable challenges and opportunities of a changing world.

It is noteworthy that left-hemispheric-dominant people do better in school and college. This is merely an empirical confirmation of a widely observed phenomenon ... that the academic world is heavily left-hemispheric-dominant, as are most of the tests by which we assess performance and what most educators call "intelligence."[2] Right-hemispheric, non-verbal intelligence is not greatly attended to or enhanced in school, and yet successful dancers, artists, craft-workers, architects, and others learn to develop it.

We are learning that people do best on the whole ... in living creatively and effectively in their personal and professional lives ... when they learn to use both hemispheres collaboratively and synergetically. Researchers have discovered that both hemispheres are required for the successful and creative development, encoding, and use of images and ideas. An increasing number of practitioners are arguing effectively for the importance of a bilateral balance in learning styles and approaches.[3]

There is growing evidence that many students whom schools label as "failures" are actually able, intelligent people who happen to be right-hemispheric-dominant. Most schools and colleges have not yet organized their structure, philosophy, and

pedagogy to educate the majority of our students, but merely continue the traditional, easy way of concentrating on the most docile students ... those whose minds most closely resemble the left-hemispheric-dominant minds of their teachers.

The researchers engaged in the instant photography project hypothesized that students who are doing badly or mediocrely in school or who are unmoved by traditional pedagogical approaches might be effectively reached and inspired by an approach that stimulated the right-hemispheric domain of the visual image. As one researcher put it: "Since a large percentage of school failures prefer right brain learning, teachers should know how to introduce a task visually and then translate it to language."[4] Knowing that metaphor is a promising connector between the visual and the verbal, they hypothesized that the photograph might, in effect, serve as a working metaphor of connection for such students.

Let me now pick up the history of the project chronologically and describe some of the stages in its subsequent development.

A project in brain synergy

For six years, the project has been in various stages of conceptualization, development, implementation, and evaluation. By 1983, over one million students in schools across the United States and Canada had participated in the project, using instant film and cameras to enhance, deepen, and strengthen their learning experiences. The schools in which the project had been placed included over ten million students.

Independent assessments of the impact of the project among users indicated a remarkably high level of satisfaction with it. 40% of the users reported themselves as "extremely satisfied" (the highest category) and 1% reported themselves as "dissatisfied" with it. The major areas in which users judged the project to be effective were: motivating students to learn, teaching visual/spatial awareness, increasing the relevance of classroom learning, and teaching baskic skills. The subject matter fields in which the project was reported as most often used were:

social studies, language, science, art, mathematics, writing, photography, special education, and physical education.

In the last two years, rigorous efforts have been made to evaluate the impact of the project in the schools where it has been used. The evaluation process has included schools in suburban, inner-city, small town, and private schools, using project materials in the areas of creative writing, mathematics, reading, and language activities. It has also included students with learning disabilities (including hearing impairment), students whose native language is not English, and college and university students.

The anecdotal evidence from teachers, students, administrators, and parents on the impact of the project was overwhelmingly favorable. The accumulation of anecdotal evidence led, in September 1982, to a year-long, controlled, statistical study of the impact of the project in the area of creative writing. Two middle-to-lower income towns were chosen for the study. The towns were typical small towns without a strong academic orientation but nevertheless affected by the common problems of inflation, unemployment, high divorce rates, and political uncertainty, with the consequent phenoma of high stress levels, many single-parent families, economic hardship, and student anxiety and alienation. Creative writing was chosen as the subject because teachers often report difficulty in teaching it, students often resist it, and it is often seen as an exclusively verbal, linear activity and hence a rigorous test for what may be perceived as a predominantly visual, spatial project.

Two different models of evaluation design were used. In the first town, seven different fifth grade classes were studied in four different schools. Three of the classes were designated as experimental groups; four were designed as control groups. The seven classes were roughly comparable in ability, but statistical procedures were used later to allow for and factor out any ability differences among

the students. All students were tested in June 1982 and again in June 1983, using the California Test of Basic Skills, a well standardized and widely used test. Their IQ scores and Total Language scores were recorded. All classes used the same curriculum and all teachers in the study agreed to teach creative writing for the same amount of time each week and to give their students the same instructions and amount of assistance in preparing their work. All students completed an identical creative writing assignment in October 1982, under comparable conditions. They completed another written assignment ... different from the first but the same for all students ... in May 1983.

The sole experimental intervention was that the three experimental classes used instant cameras, film, and curriculum guide in their creative writing classes, while the control classes did not. The writing assignments were scored by an external panel of experts, drawn from the universities and public schools, using a holistic scoring system. The criteria employed were: clarity of expression; use of imagery, metaphor, and simile; originality, freshness, and idiosyncracy; vividness and concreteness of detail; complexity and variety; sequential order, focus, adherence to the topic; paragraphig as an aid to sequence and order; and avoidance of triteness, circularity, and cliché.

The scores were processed by computer, using IQ scores as a covariate, that is, factoring out the influence of differences in student ability, as measured by IQ, on the results. For purposes of analysis, all students, from whatever class or school, who used instant cameras, film, and guide in their creative writing work were considered part of the experimental group. All students, from whatever class or school, who did not use the photographic materials, were considered part of the control group.

Analysis of the statistical results showed that students in the experimental group made significantly greater improvements in their writing ability, and in

their total language scores, than did students in the control group. (The gain in both cases was statistically significant at the 5% level). On the panel-scored test of creative writing, the experimental group's mean score went from 2.09 on the October 1982 pre-test, to a mean score of 2.47 on the May 1983 post-test. The possible range of scores was from 1 (low) to 4 (high). The control group's mean scores were 2.31 on the pre-test and 2.40 on the post-test.

On the California Test of Basic Skills Total Language Scores, the experimental group's mean score in June 1982 was 6.06 (grade equivalent) and in June 1983 it was 6.56. The control group's mean score in June 1982 was 6.91 and in June 1983 was 6.66.

In the second town, a different evaluation design was used, in order to attempt to compensate and allow for chance factors that might prevail in the first town. In order to control differences between schools and neighborhoods, the evaluation design used different classes in a single school. This time second grade classes were used. The tests used where the California Achievement Test (Reading and Language Expression Scores) and a specially devised pair (pre-test and post-test) of creative writing assignments, which were again scored by an external panel of experts, using a holistic system of scoring with criteria similar to those described for town I, adjusted for the age of the students.

Again, the sole experimental intervention was the use of instant cameras, film, and curriculum guide into the creative writing lessons of the experimental group. Otherwise, both experimental and control group followed the same curriculum, used the same texts, devoted the same amount of time to creative writing, received the same test instructions, and so on.

Statistical procedures were used to control for original (1982) Reading and Language Expression Scores. When these were used as statistical covariates, that is, their differential effects were allowed for, the experimental group showed statistically significantly greater improvement in their writing ability than did the control group (significant at the 5% level).

The experimental group's mean score on the October 1982 pre-test of creative writing was 1.51; their mean score on the May 1983 post-test was 2.26. The control group's mean score on the pre-test was 1.83; their post-test mean score was 1.92. The scores ranged from 1 (low) to 3 (high). The Language Expression Scores were as follows:

	Reading		Language Expression	
	1982	1983	1982	1983
Experimental Group	2.3	3.8	2.3	4.5
Control Group	2.2	3.5	2.4	3.6

The next stages in this continuing evaluation process include testing the project materials with special populations (for example, Inuit children of Labrador); testing more rigorously the project's effect on students' self-esteem and resulting performance; extending the work on the assessment of students' creativity; and linking the evaluation more rigorously with recent research on the left and right hemispheric development of the human brain.

In addition to these statistical procedures, interviews were conducted with teachers, administrators, parents, and students involved with the project. These interviews were part of an attempt to evaluate nuances of reaction to the experience that were not detectable by quantitative measures. The data from these interviews are too voluminous to be reproduced here. However, some themes recurred repeatedly and it may be instructive to summarize some of those major themes.

Self esteem

One of the most noticeable changes among students who used the cameras was a marked improvement in their self-esteem. Teachers, parents, and students all regularly reported this, in varying ways. Many teachers echoed in one form or another the comment from one teacher: "The camera is good for the kids' self-

image. They're proud of their pictures; they want to show them to everyone." Teachers consistently reported that students' other school work ... especially in language and mathematics ... improved along with their self-confidence, which was enhanced by a growing feeling of uniqueness and specialness that the photographs imparted: "This is my family, my farm, my pet", etc. The students gained greater self-esteem through being active photographers. Many teachers took the position that there are no bad photographs ... only interesting ones. This non-evaluative approach to their work was a rare school experience for most of these students. They usually reacted with a rush of positive confidence.

Being permitted to handle the cameras and to take them home or elsewhere for assignments turned out to be very important for the students. They saw that the teachers trusted them with an expensive and important piece of equipment and they became, consequently, trustworthy people. The following quotations from students were typical of many: "I felt good because the teachers trusted us with the cameras." "It felt good that you could take it (the camera) home. They didn't watch you." "People at home see you with the camera. They let you use other things they wouldn't let you use before." "My parents didn't use to let me use the camera. Now they do." "My mother said, 'If you don't break that one, I'll let you use mine.'" "My mother lets me use her camera (now) because she knows I can use it o.k." "My mother got me a camera for my birthday because she saw me using this one." "My grandmother is buying me one because she says I'm a big girl now."

It is clear from such reports that teachers, parents, and other adults began to change their perceptions of the students as a result of the latter's mature and competent handling of the cameras. More important, as a result of these changed perceptions and of their realization of their own competence, the students' perceptions of themselves began to change. They began to see themselves as competent, able, responsible people ... a perception that gradually affected the rest of their school work and their daily lives.

This effect on self-esteem was observable with most students, but it was especially marked among students who were doinn badly at school and among shy or quiet children. Teachers often reported that students of low achievement in school raised their level of work after the introduction of the camera. Students who were afraid of failure used the cameras, took pictures and did not fail. Thier consequent increase in confidence affected their confidence about other things.

In response to the question: what use is a camera in the classroom? one girl replied, "It can help you express your feelings, especially if you're a shy person." Teachers reported about one girl who was very quiet, had written nothing, and had shared nothing with the class. Her parents raised German Shepherd dogs. After the camera was introduced to the classroom, one of the dogs had puppies. The girl took the camera home, took pictures of the puppies, wrote about them and shared the experience with her fellow students. It was her first creative writing and her first self-opening to the class.

Connections

The camera turned out to be a formidable connective tool. Its use facilitated connections and communication between teachers and parents, between school and community, between faculty and school committee, between students and siblings and parents, and so on.

Teachers reported frequently the enhancement of communication with parents as a result of the photographic work. Cameras passed between school and home; school pictures were shared at home and home pictures were shared at school; parents, siblings, and grandparents came to school for photographic exhibitions; teachers received parental reports on students' improved attitudes. One teacher commented on students' pictures; "They enabled us to understand the home without being there." Another teacher remarked, after seeing a student's pictures of her family at home, including her Indian mother in a sari, "I suddenly became aware of the child's cultural background at home and how different it was from school."

Photographs were used to provide additional information on parents' nights. Exhibitions of students' photographs added another dimension to parents' understanding of their children's experiences. One school arranged for an exhibition of students' photographic work at the local art museum. Families were proud visitors. One school system superintendent reported, "The enthusiasm among the teachers is enough evidence for me to continue to support the project."

A reading coordinator in one school district borrowed the camera to take pictures in school of the students working as data for a presentation before the school committee, which found the camera to be an effective communication tool.

The task of taking pictures at home or of one's family became an opportunity for the deepening of connections with siblings and parents. One assignment was to take pictures of people in their working clothes or uniforms. When parents were chosen for these photographs there was often a raising of students' awareness of parental roles. Whenever a student reached out to a sibling or friend or parent to say, "I want you in my picture," she was, in effect, saying, "You are important to me." This outreach made new or deeper connections for many students.

Responsibility

A very frequent report from parents was that the use of the camera had helped their children considerably in the area of responsibility. As students were trusted with the equipment, they grew in responsibility. They took the cameras home or on field trips and had to take care of them. This involved such concerns as not leaving the camera in the rain, not letting little sister use it, not letting the dog chew it, convincing older brother that he did not have the right to try it, and so on. Some of these were not small responsibilities.

The record of taking care of cameras, even among young children, amazed many people, including teachers and parents. In one lower-middle-class school, out of 80 students who took cameras home, only one forgot to return it the next day. Although the cameras were plastic and not very sturdy, it was extremely rare that one was dropped or damaged. The total of cameras lost or broken was a tiny fraction of those used. The entire experience was a telling example of trust leading to trustworthiness. Students who perceived that they were regarded as responsible people acted responsibly.

Collaboration

It was frequently reported that one of the changes associated with the use of cameras was that there was more collaboration in classrooms that used the cameras then in those that did not. There was a great deal of picture-sharing. The instant photograph, unlike the conventional photograph, lends itself to immediate sharing, comparing, and conversation. Students needed other students for group pictures or action pictures. This need compelled them to practice their negotiation skills, to compromise, and to collaborate. It was also noteworthy, however, that students in the experimental classes shared their written work more with one another. It was as if the habits of collaboration engendered by the camera and the instant photograph persisted into their reading one another's written work, asking for comments from others, and helping one another with their work.

In addition, the presence of the cameras in certain classrooms and schools stimulated interest among other teachers, students, and parents. There were frequent inquiries about what was going on, as a result of students in the experimental groups appearing to be excited, motivated, and busy. After the experimental period was over, many other teachers came to the experimental classrooms to borrow cameras, materials, and ideas, engendering collaboration and mutual help among teachers who were often previously isolated.

Autonomy and authority

It was discovered that the project brought about significant changes in the way students thought about themselves and their work. They needed to make autonomous decisions about what to photograph. This decision-making process lent authority to their self-perceptions. The student was the photographer and,therefore, in an important sense, "owned" the photograph. She was the "author" of the work, and hence became the authority, whom others --- students, teachers, parents --- had to consult to learn about the intention, angle, meaning, and evaluation of the photograph. This was unfamiliar but heady stuff for many students who were not accustomed to doing well in school or being consulted as authorities on anything. One student commented, "At school you just copy what your friends do but at home you take the picture and it's your own."

Student-teacher relations

Powerful impact on student-teacher relations was a commonly observed consequence of the introduction of the camera into the classroom. A typical comment was that of one teacher who said, "The atmosphere changes dramatically when the camera enters the room." When pressed, teachers would talk about increased motivation, excitement, involvement, presentness among students.

Many teachers used the camera to record events that demonstrated student growth or achievement. "If someone has done a super job I take his photo and put it up for display. It makes the kids feel good," said one teacher. Another commented, "I take the kids' pictures in September. It lets them see how they've changed since then." And another, "As a graphic display of individual progress, it more than met my expectations." Several teachers commented on the significance of photographing a special event or occasion in the life of the student or class. The act of photographing imbues the event with special dignity and importance. It was worthy of being recorded. The image allows the event to be recalled: "Do you remember this?" Such images and recollections become part of the collective history and culture of the class.

Teachers reported that the students' photographs opened up new channels of communication and understanding between teacher and student. "I know more about my children now than I did before," said one. Teachers told of seeing things through students' eyes that they were not accustomed to seeing. Students often photographed and wrote about personal, private, hitherto secret things. One teacher commented: "It was important for helping us to focus on kids' problems."

One male teacher reported that a boy in his class, who had no father at home and who hated the man his mother lived with, took a picture of the teacher as "My favorite person." After that, the boy engaged in much more touching and hugging of the teacher. The boy took a photograph of the teacher and two students and then wrote at length --- but only about the teacher. Apparently the camera and picture taking released some feelings towards the teacher that were there before but had not been able to be released.

Teachers learned to see the world through their students' eyes as the students manifested their perceived worlds on film. Sensitive teachers obtained unique windows into what their students were thinking and feeling. A process of mutual discovery occurred as teachers and students learned to perceive each other, as well as photographed objects, more accurately. The insights gained served to deepen relations between teacher and student.

Writing and visualization

Why did the experimental group produce better writing than the control group? We do not know, but teachers' and students' comments may shed some light on the matter.

Teachers who used the camera as a tool in creative writing were consistently impressed by the way it seemed to facilitate the writing process. Some typical comments are the following: "It [the camera] releases kids to write. They start sooner, write more. It's their personal experience: 'I was there. I did it.'" "The picture holds the idea ---which they otherwise lose." "The kids with pictures got down to the task of writing faster." "Kids with lower writing skills focused better." "I make better use of my writing period. I get further. We are now to the first proof-reading stage in 45 minutes, which we never were before, because they've thought it out before through their pictures." "The kids and I learned how to see."

And what about the students themselves? Some typical comments follow from students in the experimental group. "It's easier. The picture's right there." "It [the photograph] gives you an idea what you're going to write about." "It's already written ---it's in the picture." "It's right there --- you can see it all." "You've done your thinking at home --- it's all put out for you." "You just have to put down what you thought." "You don't forget the details because you can see it in the picture." "It's more fun doing a writing thing." "It helps us to describe what we're meaning better."

From these and similar comments comes an inference that, through the medium of the camera and film, students are better able to make a synthesis of image and concept, to move more easily from concrete to abstract, to improve their perceptual capacities and sensitivities in ways that have powerful effects on their reading and writing.

Transfer to other domains of thinking

This project focused on the connection between instant photography and creative writing. However, many teachers reported that the results of the project penetrated into many other domains of student thinking.

Other teachers who had contact with these students reported to the writing teachers changes they had observed in students' work. Art teachers, for example, reported that students were making more details in art and seemed more confident in the visual domain. One art teacher commented, "It helps children get over the idea that they're not artists and can't draw. They take good photos and then can be led into drawing and painting." Another art teacher --- aware of budgetary constraints --- said, enviously, "You've got your dark room right in the camera."

Instant feedback

Finally, it must be recognized that these students live in a world that is dominated by visual images and quick responses. Many of them spend more daily hours before a television screen than before a teacher. They are accustomed to 30-second commercial breaks and rapid attention-adaptation. B. F. Skinner long ago damonstrated the learning power contained in instant feedback.

The typical school, by contrast, is predominantly left hemispheric, verbal, linear, and given to postponed gratification. Many teachers ascribed much learning power to the speed, ease of operation, visual delight, and instant feedback provided by instant photography. One gratified teacher reflected, "Kids watch so much TV that school is experienced as boring. The camera is a live element in the school." "It helps you to see carefully and get instant feedback," said another. "Instant photography made it possible for me to express myself spontaneously," said one teacher.

And yet, said another, "It's so easy to use the camera --- but it can be used to support complex concepts." And, "It permits great speed in the development of concepts --- expecially with gifted children --- because of the instant development."

Conclusion

In the final century of the Industrial Era (from the 1850's to the 1950's), we had the natural resources, unpolluted biosphere, and unexplored territories to permit us to be lavishly wasteful --- in education as in other sectors of the culture. We did not have to be very efficient, nor did inventiveness and creativity need to be widespread throughout the population. Indeed, the hierarchical structure and the dull, repetitive labor at the lower levels of the organizational pyramid militated against universal education for initiative, creativity, and responsibility . We could afford to teach wastefully ----by focusing our attention only on the docile, that is, students who thought like their teachers, and treating other students (even if they were the majority) as if they were "slow," "unintelligent," "difficult," or some other excluding category. The rising tide of industrialism raised almost all boats. Even if many leaky row-boats sank to the bottom, the splendid array of luxury yachts being lifted stifled the murmuring protests.

But that tide is receding very fast. The industrial economy is in serious crisis. Fortunately, the new tide of the emerging high-technology, information economy promises to take its place. But we are in a period of critical transition. For many people the days are lean and austere. We can no longer afford the wastefulness of the high-industrial era. Our natural resources are depleted; the biosphere is at risk through industrial pollution; we are pushing against the far edge of many physical and material territories. Moreover, the horizontal, participatory, networking

structures of the electronic information culture render anachronistic the hierarchical, unbalanced, grossly unequal distribution of creativity, initiative, and responsibility that marked the old industrial culture.

In education, we need urgently a less wasteful, more effective, better balanced structure and pedagogy that can enable us to survive the dying of the industrial culture and to prosper in the emergence of the electronic information culture. The great unexplored frontier that remains to us is, of course, the human brain. Our wasteful, inefficient pedagogy has hardly touched its possibilities. One of the most promising ways to increase its power is through the development of synergetic collaboration between its left and right hemispheres.

There seems little doubt that, by ignoring or depreciating the mental operations that are right-hemispheric dominant, the industrial culture of the school has committed an enormous waste of creative human talent, has given millions of students a false and wholly inappropriate notion of their own inferiority, and has engendered a destructive war between its own left-hemispheric dominant culture and the emerging visual-spatial culture of television, video-games, magazines, movies, billboards, pictures, photographs - a culture in which most of its students are more at home than their teachers.

The photographic project described above attempts to assist the move into the emerging culture by respecting and celebrating the visual image, by recognizing that, for many ... perhaps most ... young people, the right hemispheric domain is their preferred way of thinking, and by using the visual-spatial domain not as the end of the educational process but as an appropriate entry-point for many students, leading them on from there to a fuller, more synergetic, and vastly more effective use of both right and left hemispheres of the brain.

The use of instant photography is seen as a valuable pedagogical tool that has demonstrated its power to achieve some of the goals

at the beginning of this paper and holds promise of even more creative and synergetic power when used with a greater diversity of fields and populations.

NOTES

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